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PATENT

ANTI-THEFT DEVICE OF VEHICLE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a national stage application under 35 U.S.C. § 371 of PCT Application No. PCT/JP2004/018696 designating the United States, filed December 15, 2004. The PCT Application was published in Japanese as WO 2005/080154 A1 on January 9, 2005 and claims the benefit of the earlier filing date of Japanese Patent Application No. 2004-356376, filed December 9, 2004, which claims the benefit of the earlier filing date of Japanese Patent Application No. 2004-048005, filed February 24, 2004. The contents of Japanese Patent Application No. 2004-356376, Japanese Patent Application No. 2004-048005, and International Application No. PCT/JP2004/018696 including the publication WO 2005/080154 A1 are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTIONS

Field of the Inventions

[0002] The present inventions relates generally to anti-theft devices, and more specifically, to an anti-theft device of for a vehicle such as a 4four-wheeled vehicle or a motorcycle.

Description of Background Art

[0003] A conventional vehicle anti-theft device of vehicle is that the provides anti-theft operation of which that can be set by a user when the vehicle is not in use, for example, by turning off the ignition switch of vehicle. However, since there is a case in which the anti theft device is the user may not desired to be set or arm the anti-theft device every time the ignition is turned off (for example, during fueling of the vehicle charge at a gas stand), other anti-theft devices there has have been developed an anti theft device of which setting of that are not armed anti theft can be avoided if the key of ignition switch is positioned at a position other than the OFF position when the engine is not running ignition switch is turned off. In addition, there has been developed an another type of anti-theft device has been developed of vehicle in which the anti-theft device can be be released

disarmed if the key of ignition switch is operated to a position other than the ON position when the ignition switch is turned on from a condition in which the anti-theft has been set (see e.g. Japanese Laid-open Patent Publication No. 211564/2000).

~~Disclosure of the Invention~~

~~Problems to be solved by the Invention~~

[0004] ~~However~~As indicated above, according to the prior art vehicle anti-theft devices of vehicle of the prior art, it is necessary often require the user to turn the ignition switch key to a position other than the OFF position in order to avoid the alarm means of prevent the anti-theft device to be operated from being armed after when the ignition switch is turned off, for example, during fueling of the vehicle charge at a gas stand. This complicates the operation of the anti-theft device. In addition, due in part to its complicated operation, a the user would might often forget to properly position the key when turning the vehicle off. Such action could result in the unintentional and unconscious arming of the anti-theft device. Of course, the user later realizes that the device has been armed when the user accidentally trips the device and causes the the operation of the anti theft device and thus unexpected alarm to sound, which can be annoying to the user as well as those in the vicinity of the vehicle would be generated because of unintended setting of the anti theft device.

SUMMARY OF THE INVENTIONS

[0005] ~~It is, therefore, a~~According to an some embodiments n object of the present invention, there is provided to provide an vehicle anti-theft device better helps users to avoid of vehicle which can easily determine whether or not the accidentally triggering the alarm. anti-theft device should be set. In this regard~~For example, the device can have on its an anti-theft caution condition which, prevents the generation of unintentional alarm sounds and/or as well as disabling disability of start of the engine. Further, in some embodiments, and also the user can easily select whether to setting or not of the anti-theft caution condition, in accordance with the user's preference.~~

Means for solving the problems

[0006] ~~According to~~ In accordance with an implementation of the present invention ~~embodiment of claim 1, there is provided an~~ the vehicle anti-theft device of vehicle can comprise ~~comprising~~ at least one of an alarm means and an immobilizer means. The alarm means can for generating an alarm upon detection of theft. The ~~and an~~ immobilizer means ~~for~~ can preventing the starting of engine upon detection of theft. Further, ~~characterized in that~~ at least one of the alarm means and the immobilizer means can be set to an anti-theft ~~caution condition when an ignition switch of vehicle is turned off, and can be set~~ under a condition in which a dimmer switch is either in a high-beam or a low-beam position.

[0007] ~~According to an anti theft device of vehicle of claim 2~~ In an some ~~embodiments where the position of the dimmer switch is used in relation to the setting of the alarm, a~~ the device can be configured such that the user can freely select adjust the setting of ~~at his will the setting or unsetting of the alarm means and the immobilizer means~~ corresponding to in which the position of the dimmer switch is selected.

[0008] ~~According to the present invention of claim 3~~ In accordance with another ~~embodiment, there is provided an~~ the vehicle anti-theft device of vehicle ~~comprising at least one of an alarm means for generating alarm on detection of theft and an immobilizer means for preventing the start of engine on detection of theft~~ characterized in that can be configured with at least one of the alarm means and the immobilizer means ~~can being~~ set to an anti-theft caution condition when an ignition switch of vehicle is turned off and ~~under a condition in which a headlight is either in lighting or lighting-off.~~

[0009] In accordance with yet another embodiment ~~According to an anti theft device of vehicle of claim 4, a~~ user can freely select at his will configure the device such that

~~the setting or unsetting of the alarm means and the immobilizer can be set or not depending on in which condition whether the headlight is therein a lighting or lighting-off state.~~

[0010] In accordance with yet another embodiment~~According to the present invention of claim 5,~~ there is provided an anti-theft device of vehicle comprising at least one of an alarm means for generating alarm on detection of theft and an immobilizer means for preventing the start of engine on detection of theft. characterized in that a~~At least one of the alarm means and the immobilizer means can be set to a caution condition in accordance with a combination of a high-beam or a low-beam position of a dimmer switch and a lighting or lighting-off condition~~lighting-off state of a headlight.

~~According to an anti-theft device of vehicle of claim 6, a user can freely select at his will the setting or unsetting of the alarm means and the immobilizer in which combination of the dimmer switch position and the headlight condition is there.~~

[0011] In accordance with yet another embodiment~~According to an anti-theft device of vehicle of claim 7,~~ a setting confirmation sound is~~can be~~ generated when the alarm means or the immobilizer means is set.

[0012] In accordance with yet another embodiment~~According to an anti-theft device of vehicle of claim 8,~~ the alarm means can comprises a hazard warning lamp flashing means for flashing hazard warning lamps during operation of the alarm means and a hazard warning lamp flashing switch. In one implementation, the alarm means~~and~~ can start the flashing of the hazard warning lamps by the hazard warning lamp flashing switch under a condition in which the caution means is not set.

[0013] In accordance with yet another embodiment~~According to an anti-theft device of vehicle of claim 9,~~ the alarm means is~~can be~~ a piezoelectric buzzer. The alarm means can;~~wherein~~ further comprising~~ing~~ a control section having an oscillating means for controlling the anti-theft device of vehicle and for generating a signal for the piezoelectric

buzzer. Further, the alarm means can also comprise, ~~and~~ a piezoelectric driving section for driving the piezoelectric buzzer; In addition, ~~and~~ the control section, the piezoelectric buzzer driving section, and the piezoelectric buzzer ~~are~~ can be formed as a unit.

Effects of the Invention

~~According to the invention of claim 1, it is possible to easily determine whether or not the anti-theft device should be set on its caution condition simply by selecting either one of the high beam position or the low beam position of the dimmer switch. In addition, because of easiness of selection of high beam position or the low beam position of the dimmer switch, it is possible to prevent generation of unintentional alarm sound as well as disability of start of engine.~~

~~According to the invention of claim 2, since it is possible to select at user's will whether the alarm means or the immobilizer means should be set on which position the dimmer switch is positioned, easy selection can be obtained in accordance with a user's preference.~~

~~According to the invention of claim 3, it is possible to easily determine whether or not the anti-theft device should be set on its caution condition simply by selecting the condition of the headlight either on its lighting condition or lighting off condition. In addition, because of such an easiness of selection, it is possible to prevent generation of unintentional alarm sound as well as disability of start of an engine.~~

~~According to the invention of claim 4, since it is possible to select at user's will whether the alarm means or the immobilizer means should be set in which condition the headlight is there, easy selection can be obtained in accordance with a user's preference.~~

~~According to the invention of claim 5, it is possible to easily determine whether or not the anti-theft device should be set on its caution condition simply by selecting the combination of a high beam or a low beam position of a dimmer switch and a lighting or lighting off~~

~~condition of a headlight. In addition, because of such an easiness of selection, it is possible to prevent generation of unintentional alarm sound as well as disability of start of an engine.~~

~~According to the invention of claim 6, since it is possible to select at user's will whether the alarm means or the immobilizer means should be set in which condition the dimmer switch and the headlight are there, easy selection can be obtained in accordance with a user's preference.~~

~~According to the invention of claim 7, since the setting confirmation is generated when the alarm means or the immobilizer means is set, it is possible to easily know whether the anti-theft device is set on the caution condition or not.~~

~~According to the invention of claim 8, since it is possible to start the flashing of the hazard warning lamps by the hazard warning lamp flashing switch on a condition in which the alarm means is not set, it is possible to easily add a hazard warning lamp flashing function to a vehicle not equipped with such a function.~~

~~According the invention of claim 9, since the control section, piezoelectric buzzer driving section and the piezoelectric buzzer are formed as a unit and the control section has the oscillating means for controlling the anti-theft device of vehicle and for generating a signal for the piezoelectric buzzer, it is possible to change an oscillating frequency at a side of the control section and thus to appropriately change the sound of the piezoelectric buzzer. In addition, it is possible to adjust the sound pressure level of the piezoelectric buzzer by utilizing a frequency characteristics between the frequency of the piezoelectric buzzer and the sound pressure level.~~

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Additional advantages and features of embodiments of the present inventions will become apparent from the subsequent description and the appended claims, taken in conjunction with the accompanying drawings, wherein:

[0015] ~~Fig-Figure~~ 1 is a block diagram showing an arrangement of a first embodiment of the a vehicle anti-theft device of vehicle of the present invention;

[0016] ~~Figure Fig-~~2 is a block diagram showing a detailed arrangement of a ~~a-the~~ first embodiment of the vehicle anti-theft device of vehicle of the present invention;

[0017] ~~Figure Fig-~~3 is a flow chart showing the operation of the first embodiment of the vehicle anti-theft device of vehicle of the present invention;

[0018] ~~Figure Fig-~~4 is a flow chart showing the operation of a second embodiment of the vehicle anti-theft device of vehicle of the present invention;

[0019] ~~Figure Fig-~~5 is a flow chart showing the operation of a third embodiment of the vehicle anti-theft device of vehicle of the present invention;

[0020] ~~Figure Fig-~~6 is a flow chart showing the operation of a fourth embodiment of the vehicle anti-theft device of vehicle of the present invention; and

[0021] ~~Figure Fig-~~7 is a schematic view showing ~~an-yet~~ another embodiment of the vehicle anti-theft device of vehicle of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] ~~T~~Various embodiments and features of the present invention will be hereinafter described with reference to accompanied drawings. The-Embodiments of the vehicle anti-theft device of vehicle is-can intended to prevent theft of vehicles such as 4four-wheeled vehicles and motorcycles. Further, embodiments of the present invention and-has can include means for detecting the theft and informing it-to-persons around the vehicle and/or its user of the theft.

First embodiment

[0023] ~~Fig-FIG.~~ 1 is a block diagram showing an arrangement of a first embodiment of the vehicle anti-theft device_1-of vehicle of the present invention; ~~Fig-FIG.~~ 2 is a block diagram showing a detailed arrangement of a ~~the~~ first embodiment of the vehicle anti-theft device_1-of vehicle of the present invention; and ~~Fig-FIG.~~ 3 is a flow chart showing

the operation of the first embodiment of the vehicle anti-theft device 1 ~~of vehicle of the present invention.~~

[0024] As shown in ~~drawings these~~ FIGS. 1-3, ~~the an~~ vehicle anti-theft device of vehicle 1 ~~can~~ comprises an anti-theft control circuit 5 and relays ~~6-, 7, and 8.~~ ~~Connected As shown in FIG. 1, there can be connected to the vehicle anti-theft device 1 can be connected to one or more of the following:~~ ~~of vehicle 1~~ are an ignition switch 10, a dimmer switch 15, a headlight 16, a sensor 17, an electronic control unit ("ECU") 11, a turn signal lamp (L) 25, a turn signal lamp (R) 26, an alarm means 20, and an indicator 21.

[0025] The ignition switch 10 ~~is~~ can be a main switch of the vehicle, and as is known in the art, an engine of the vehicle can be started by turning the ignition switch 10 "ON". The ECU 11 ~~is~~ can be ~~an used electronic control unit~~ for controlling the engine. The ignition switch 10 can control "ON/OFF" of electric power supply to the ECU 11. The "ON/OFF" control between the ignition switch 10 and the ECU 11 ~~is~~ can be carried out by contact points of the relay 6. ~~That is~~ In an exemplary embodiment, when if the ignition switch 10 ~~relay 6~~ is not set "ON", ~~any~~ electric power cannot ~~will not~~ be supplied through the contact points 6 to the ECU 11 and ~~thus consequently~~, the engine cannot be started; as described further herein, and this such an immobilizing condition can condition result from one implementation of forms the immobilizer means. Additionally, the "ON" or "OFF" condition state of whether the ignition switch 10 is "ON" or "OFF" has ~~can been be~~ previously inputted to the anti-theft control circuit 5.

[0026] ~~As~~ illustrated in FIG. 2, the turn signal lamp (L) 25 and the turn signal lamp (R) 26 ~~are~~ can be "OR" connected to a circuit (not shown) "ON/OFF" controlled by a turn signal switch. Further, the turn signal lamp (L) 25 and the turn signal lamp (R) 26 and can be lit by the control from the anti-theft device 1. ~~The~~ For example, the relay 7 ~~is~~ can be set "ON" to light the turn signal lamp (L) 25 and the relay 8 ~~is~~ can be set "ON" to light the turn signal lamp (R) 26. The dimmer switch 15 ~~is~~ can be a switch for setting the high beam position or the low beam position of the headlight 16. The position of the dimmer switch 15

~~has~~may also have been previously inputted to the anti-theft control circuit 5. The position "ON" or "OFF" of the headlight ~~is~~can also be inputted to the anti-theft control circuit 5.

[0027] The anti-theft control circuit 5 ~~is~~can be formed by a microcomputer (CPU) and an input/output circuit. ~~The anti-theft control circuit 5 and can controls whole the vehicle anti-theft device 1 of vehicle 1 using its a dedicated program.~~ However, other means such as a sequencer or a logic circuit ~~may~~can be used for controlling the circuit 5. The alarm means 20 ~~is~~can be a sound generator, such as a buzzer. The indicator 21 ~~is for example LEDs or lamps can be configured for to indicateing the operating condition of the vehicle anti-theft device 1, and can include LEDs or lamps.~~ The sensor 17 ~~is~~can be, for example, an acceleration sensor, a gravity sensor, etc., ~~for detecting unintentional movement of vehicle by detecting inclination or vibration of vehicle.~~ The indicator 21 ~~is~~can be arranged ~~at a place giving easy view for such that a driver of the vehicle can easily visually perceive whether the indicator 21 is illuminated.~~ Although the mounting position of the anti-theft device 1 is not limited, it ~~is~~can be preferable to select a place that prevents removal of difficult to remove the device 1 from outside of the vehicle.

[0028] Although the ~~arrangement~~embodiments shown in ~~Figs.~~FIGS. 1 and 2 can includes two immobilizer means for inputting the ignition switch 10 to relay 6, it is contemplated that other embodiments of sufficient for the anti-theft device 1 to can include at least one immobilizer means. In addition, although embodiments the arrangement is can be structured so that respective conditions-states of the dimmer switch 15 and the headlight 16 can be inputted, it is contemplated is sufficient for the anti-theft device 1 to have that in other embodiments, at least one of the states of at least one of the dimmer switch 15 and the headlight 16 them can be inputted into the anti-theft device 1. Furthermore, according to other embodiments, the function of lighting the turn signal lamps (L, R) 25 and 26 is do not necessarily required need to be turned on, i.e. illuminated.

[0029] ~~The Exemplary the~~ operation of embodiments of the anti-theft device 1 ~~of vehicle 1 will now be hereinafter described.~~ Reference numerals enclosed in brackets in

the following description correspond to those shown in an exemplary -flow chart of Fig.FIG. 3.

[0030] In the ~~description below~~ accordance with an implementation of the present invention, circumstances in which the anti-theft device 1 is can be set configured when with the dimmer switch 15 is in the a low beam position or a high beam position. The operation of an embodiment of the device 1, wherein the dimmer switch 15 is in the low beam position, will now be described (such an embodiment is included No. 1 in Table 1 below as No. 1). Nevertheless, it is also noted that Table 1 shows several combinations of settings obtained from positions of the dimmer switch 15. Other such Ddetails of Table 1 will be are described laterfurther below.

[0031] [Table 1]

		Dimmer switch	
		Low position	High position
No.1	Alarm+Immobilizer	Set	—
No.2	Alarm+Immobilizer	—	Set
No.3	Alarm	Set	—
No.4	Alarm	—	Set
No.5	Immobilizer	Set	—
No.6	Immobilizer	—	Set

[0032] ~~First of all~~ Referring now to the flowchart illustrated FIG. 3, the “ON” or “OFF” state condition of the ignition switch 10 is initially observed (S101) and concrete control is carried out when the ignition switch 10 is turned “OFF” (S101 OFF). When the ignition switch 10 is turned “OFF”, confirmation of the position of the dimmer switch 15 is can be carried out (S102). When Thus, in accordance with an embodiment, with the ignition switch turned “OFF”, and the dimmer switch 15 is in the high beam position, the device 1 it is will not be shifted to the anti-theft caution condition. T and thus, the operation of turning

the ignition switch 10 “OFF” would ~~causes only cause stop of the engine to stop~~ (S102-Hi), and would not set the anti-theft caution condition (S103) of the device 1.

[0033] ~~W~~However, when the dimmer switch 15 is in the low beam position (S102-low), the device 1 can be set to the anti-theft caution condition ~~is set~~ (S103). ~~One concrete content of the setting of~~When the device 1 is set to the anti-theft ~~is~~, caution condition ~~first of all, a to generate~~ setting confirmation sound ~~for indicating can be generated that indicates that the device 1 has been set the setting of to the~~ anti-theft caution condition. The setting confirmation sound ~~is~~ can be generated by using the alarm means 20. In addition, the immobilizer means ~~is~~ can be operated so that the relay 6 is turned “OFF” ~~in order to not so as to prevent start of the an engine. Then~~ In addition, according to an implementation of the device 1, ~~it the~~ setting of the device 1 to the anti-theft caution condition can be ~~is~~ indicated by flashing ~~of the~~ indicator 21 ~~that the situation is now in the anti-theft caution condition~~ (S104). ~~Thus~~ At this point, the driver can leave his (or her) vehicle.

[0034] ~~W~~Referring still to FIG. 3, if ~~hen~~ the key is inserted to the ignition switch 10 and turned “ON” during the anti-theft caution condition (S105-ON), the anti-theft caution condition ~~is~~ can be released (S108). ~~One concrete content of t~~The releasing ~~release of the~~ anti-theft caution condition ~~is~~ can include ~~to light out~~ turning off the indicator 21 and ~~to stop deactivating the immobilizer means by turning the relay 6 “ON”.~~

[0035] ~~U~~nder ~~While the device 1 is set to the~~ anti-theft caution condition, operation of the sensor 17 ~~is~~ can be observed by the anti-theft control circuit 5 (S106). If the sensor 17 ~~detects unintentional vibration or movement of vehicle under the anti-theft caution condition~~ (S106-Yes), the alarm ~~is~~ can be generated ~~triggered~~ (S107). ~~One concrete content of t~~Triggering of the alarm ~~is to~~ can include the ~~generate~~ generation of an alarm sound by the alarm means 20. Additionally, the triggering of the alarm ~~It is~~ can additionally also possible ~~to cause other manifestations, including flashing of the turn signal lamps (L, R) 25 and 26.~~

[0036] As described above, ~~since it the device 1 is can be shifted set~~ to the anti-theft caution condition when the ignition switch 10 of vehicle is turned "OFF" and the dimmer switch 15 is in under the low beam position. ~~Indeed condition of the dimmer switch 15, in one implementation, when the ignition switch 10 is turned "OFF", setting the device 1 to anti-theft caution condition depends only on whether the dimmer switch 15 is in the high or low beam position. it can be easily determined whether or not it should be set in the anti-theft caution condition only by selecting the position (high beam or low beam position) of the dimmer switch 15.~~ The easiness ~~facility~~ of selection ~~makes tends to ensure that the selecting method unforgettable and thus makes it possible to prevent generation of the driver will not trigger an unintentional alarm sound and disable~~ ~~ility of start of the engine.~~ That is, when a ~~the driver does not want to set the anti-theft device 1 (such as, for example, when a the driver leaves a the vehicle unattended within a short range the eye can reach e.g. such as a case of fuel charge at a gas station), it the device 1 can be easily operated, the anti-theft caution condition can be easily controlled, provide easy selection and prevent unintentional generation of alarm sound and disability of start of the engine can be prevented, only by setting the ignition-dimmer switch 15 at the high beam position.~~

[0037] ~~Although i~~As described above, ~~t has described above that the alarm means and the immobilizer means are can be set when the dimmer switch 15 is in the low beam position, as shown in No.1 in Table 1.~~ However, according to another embodiment of the device 1, ~~it is also possible to make the condition of the anti-theft device 1 so that the alarm means and the immobilizer means can be set when the dimmer switch 15 is in the high beam position, as shown in No. 2 in Table 1.~~ In ~~addition~~ another embodiment of the device 1, it is possible ~~to make the condition of the anti-theft device 1 so that only the alarm means can be set when the dimmer switch 15 is in the low beam position, as shown in No. 3 in Table 1.~~ In yet another embodiment of the device 1, ~~it is also possible to make the condition of the anti-theft device 1 so that only the alarm means can be set when the dimmer switch 15 is in the high beam position, as shown in No. 4 in Table 1.~~ In yet another embodiment of the device 1, ~~Furthermore it is possible to make the condition of the anti-theft device 1 so that only the immobilizer means can be set when the dimmer switch 15 is in the low beam position, as~~

shown in No. 5 in Table 1. In yet another embodiment of the device 1, and similarly so that it is possible that only the immobilizer means can be set when the dimmer switch 15 is in the high beam position, as shown in No. 6 in Table 1. ~~It is further possible~~ Finally, in yet another embodiment of the device 1, not limited to the combinations in Table 1, it is possible to make the device 1 anti-theft caution condition so that at least one of the alarm means and the immobilizer means ~~is~~ can be set to the anti-theft caution condition when the ignition switch 10 is turned "OFF" ~~and in condition of~~ the dimmer switch 15 is either in the high beam or the low beam position. Various other combinations and configurations can also be implemented. In any case, implementations of the device 1 can allow it is possible to easily determine easy and ready determination as to whether it the device 1 should be set to the anti-theft caution condition or not. ~~In addition~~ It is contemplated that such facility, easiness of selection can tend makes it possible to prevent unintentional generation of the alarm sound and disabling the ability of start of the engine.

[0038] In any of the arrangement embodiments described above, the driver can selection a given at which setting (such as those illustrated in Nos. 1-6 of Table 1) at which the anti-theft device 1 will be operated. The device 1 can be configured such that the selection of the setting should be operated can be determined in is done in a a-secured manner, such as by the anti-theft control circuit 5 or in a selectable manner by providing a switch in the anti-theft control circuit 5 for selecting at which setting in Table 1 the anti-theft device 1 should be operated. In this regard, the driver can freely select the operational setting of By providing one the anti theft device of vehicle 1 with free setting selection ability, according to the it is possible to have easily setting of selection suitable for preference of the driver, the destination of vehicle, the type of vehicle, and/or the cost of vehicle. Further, such a setting capability may also and thus possible to reduce the manufacturing cost of the device 1 thereof.

[0039] ~~In addition, a~~ According to the arrangement described above an implementation of the device 1, the driver can also easily know whether the device 1 is set to the anti-theft caution condition. For example, as mentioned above, since the setting

confirmation sound can be generated when ~~it~~ the device 1 has been set to the anti-theft caution condition, ~~it is possible to easily know whether the device 1 has been set to the anti-theft caution condition.~~ Furthermore, it is possible to signal to the driver that the device 1 is not set, for example, by providing the device 1 with the hazard warning lamp flashing switch that can, ~~it is possible to commence the flashing of the hazard warning lamps if the device 1 is not set under a condition in which the alarm means is not set.~~ Such a feature ~~Also it is possible to can be easily added the hazard warning lamp flashing function to a vehicle having been that does not provided with have~~ the hazard warning lamp flashing function by providing the anti-theft device 1 with such a function.

Second embodiment

[0040] ~~Fig.~~ FIG. 4 is a flow chart showing the operation of ~~the another second~~ embodiment of the anti-theft device 1 of vehicle of the present invention.

[0041] Similarly to the ~~anti-theft device of vehicle 1~~ shown in ~~Fig.~~ Figs. 1 ~~and Fig. 2,~~ the anti-theft device ~~of vehicle 1 of the second embodiment represented in FIG. 4~~ can comprises the anti-theft control circuit 5 and relays 6, 7, and 8. ~~Connected to the anti-theft device of vehicle 1 are a~~ Additionally, then ignition switch 10, ~~a the~~ dimmer switch 15, ~~a the~~ headlight 16, ~~a the~~ sensor 17, ~~an the~~ ECU 11, ~~a the~~ turn signal lamp (L) 25, ~~a the~~ turn signal lamp (R) 26, ~~an the~~ alarm means 20, and ~~an the~~ indicator 21 can be connected to the device 1. Since each of these structural elements can be theis same as that of the ~~first~~ embodiment described above, a detailed description of themse elements will ~~be not be repeated~~ omitted. As mentioned above, although the ~~arrangement-embodiment~~ shown in ~~Figs.~~ Figs. 1 and 2 can includes two immobilizer means for inputting the ignition switch 10 to relay 6, it is sufficient for the anti-theft device 1 to include at least one immobilizer means. In addition although the arrangement ~~is~~ can be structured so that respective ~~conditions-states~~ of the dimmer switch 15 and the headlight 16 can be inputted, input of at least one of these states it is ~~is~~ can be sufficient for the anti-theft device 1 to have at least one of them. Furthermore, the ~~function of lighting of~~ the turn signal lamps (L, R) 25 and 26 is not necessarily required.

[0042] Exemplary ~~Then the operations of the anti-theft device of vehicle 1 of the embodiment represented in FIG. 4 will be hereinafter now be described.~~ Reference numerals enclosed in brackets in the following description correspond to those shown in a flow chart of ~~Fig.~~ FIG. 4.

[0043] ~~In the description below~~ accordance with another implementation of the present invention, ~~circumstances in which the anti-theft device 1 is set when can be configured with the headlight 16 is in the a lighting~~ lighting condition state or a lighting-off state. ~~The operation of an embodiment of the device 1, wherein the headlight 16 is in the lighting state, will now be described (such an embodiment is included~~ No. 1 in Table 2 below as No. 1). ~~Nevertheless, it is also noted that Table 2 shows several combinations of settings obtained from condition state of the headlight 16. Other such~~ Details of Table 2 will be are described later further below.

[0044] [Table 2]

		Headlight	
		Lighting <u>Lighting</u> condition <u>state</u>	Lighting-off condition <u>Lighting-off</u> <u>state</u>
No.1	Alarm+Immobilizer	Set	—
No.2	Alarm+Immobilizer	—	Set
No.3	Alarm	Set	—
No.4	Alarm	—	Set
No.5	Immobilizer	Set	—
No.6	Immobilizer	—	Set

[0045] ~~First of all~~ Referring now to the flowchart illustrated in FIG. 4, the “ON” or “OFF” ~~state condition~~ of the ignition switch 10 is initially observed (S201). ~~and concrete control is carried out when the ignition switch 10 is turned “OFF” (S201 OFF).~~ When the

ignition switch 10 is turned "OFF", confirmation of the ~~condition-state~~ of the ~~lighting~~ of the headlight 16 is carried out (S202). Thus, in accordance with an embodiment, with the ignition switch 10 turned "OFF", and When the headlight 16 is in the lighting-off condition~~lighting-off state~~, it the device 1 is not shifted to the anti-theft caution condition, and t~~Thus, the operation of turning the ignition switch 10 "OFF" would causes-only cause the stop of engine to stop (S202-Lighting-off), and would not set the device 1 to the anti-theft caution condition (S203).~~

[0046] ~~When~~However, when the headlight 16 is in the ~~lighting~~lighting condition state (S202-Lighting), the device 1 can be set to the anti-theft is-caution condition set (S203). ~~One concrete content of the setting of~~When the device is set to the anti-theft caution condition is, first of all, to generate a setting confirmation sound can be generated that for ~~indicating that the device 1 has been set to the setting of anti-theft caution condition.~~ The setting confirmation sound ~~is~~can be generated by using the alarm means 20. In addition, the immobilizer means ~~is~~can be operated so that the relay 6 is turned "OFF" in order to prevent not so as to start of the an engine. In addition, according to an implementation of the device 1, Then the setting of the device 1 to the anti-theft caution condition can be it is indicated by flashing of the indicator 21 that the situation is now in the anti-theft caution condition (S204). Thus the driver can leave his (or her) vehicle.

[0047] ~~When~~Referring still to FIG. 4, if the key is inserted to the ignition switch 10 and turned "ON" during while the device 1 is in the anti-theft caution condition (S205-ON), the anti-theft caution condition is~~can be released (S208).~~ ~~One concrete content of t~~The releasing-release of the anti-theft caution condition is~~can include to light- turning off the indicator 21 and to stop deactivating the immobilizer means by turning the relay 6 "ON".~~

[0048] ~~Under~~While the device 1 is set to the anti-theft caution condition, operation of the sensor 17 ~~is~~can be observed by the anti-theft control circuit 5 (S206). If the sensor 17 detects unintentional vibration or movement of vehicle under the anti-theft caution condition (S206-Yes), the alarm is~~can be generated-triggered (S207).~~ ~~One concrete content~~

Triggering of the alarm is to include the generate-generation of an alarm sound by the alarm means 20. Additionally, the triggering of the alarm can also cause other manifestations, including It is additionally possible to flashing of the turn signal lamps (L, R) 25 and 26.

[0049] As described above, ~~since it the device 1 is can be shifted set~~ to the anti-theft caution condition when the ignition switch 10 of vehicle is turned "OFF" ~~and under the~~ headlight 16 is in the ~~lightinglighting conditionstate~~. Indeed, in one implementation, when the ignition switch 10 is turned "OFF", setting the device 1 to anti-theft caution condition depends only on whether the headlight 16 is in the lighting or lighting-off position, it can be easily determined whether or not it should be set in the anti-theft caution condition only by selecting the condition (lighting or lighting-off condition) of the headlight 16. The easiness facility of selection makes the selecting method unforgettable and thus makes it possible to prevent generation of tends to ensure that the driver will not trigger an unintentional alarm sound and disableility of start of the engine. That is, when at the driver does not want to set the anti-theft device 1 (such as , for example, when a the driver leaves a the vehicle unattended within a short range the eye can reach e.g. such as a case of fuel charge at a gas station), it the device 1 can be easily operated, the anti-theft caution condition can be easily controlled, provide easy selection and prevent unintentional generation of alarm sound and disability of start of the engine can be prevented, only by setting the headlight 16 at the light-off condition.

[0050] ~~Although it has As~~ described above, ~~that the alarm means and the immobilizer means are can be set~~ when the headlight 16 is in the ~~lightinglighting conditionstate~~, as shown in No.1 in Table 2. However, according to another embodiment of the device 1, it is also possible to make the condition of the anti-theft device 1 so that the alarm means and the immobilizer means can be set when the headlight 16 is in the lighting-off conditionlighting-off state, as shown in No. 2 in Table 2. In additionanother embodiment of the device 1, it is possible to make the condition of the anti-theft device 1 so that only the alarm means can be set when the headline 16 is in the lightinglighting conditionstate, as

shown in No. 3 in Table 2. In yet another embodiment of the device 1, it is also possible to make the condition of the anti-theft device 1 so that only the alarm means can be set when the headlight 16 is in the lighting-off conditionlighting-off state, as shown in No. 4 in Table 2. In yet another embodiment of the device 1, Furthermore it is possible to make the condition of the anti-theft device 1 so that only the immobilizer means can be set when the headlight 16 is in the lightinglighting conditionstate, as shown in No. 5 in Table 2. In yet another embodiment of the device 1, and similarly so it is possible that only the immobilizer means can be set when the headlight 16 is in the lighting-off conditionlighting-off state, as shown in No. 6 in Table 2. It is further possibleFinally, in yet another embodiment of the device 1, not limited to the combinations in Table 2, it is possible to make the device 1 anti-theft caution condition so that at least one of the alarm means and the immobilizer means is-can be set to the anti-theft caution condition when the ignition switch 10 is turned "OFF" and in condition of the headlight 16 is either in the lightinglighting or the lighting-off conditionlighting-off state. Various other combinations and configurations can also be implemented. In any case, implementations of the device 1 can allow-it is possible to easily determine easy and ready determination as to whether it-the device 1 should be set to the anti-theft caution condition or not. In addition, It is contemplated that such facility easiness of selection makes it possible can tend to prevent unintentional generation of the alarm sound and disability-disabling of the start of the engine.

[0051] In any of the arrangement-embodiments described above, the driver can selection a given at which-setting (such as those illustrated in Nos. 1-6 of Table 2) at which the anti-theft device 1 will be operated. The device can be configured such that the selection of the setting should be operated can be determined in-is done in a secured manner, such as by the anti-theft control circuit 5 or in a selectable manner by providing a switch in the anti-theft control circuit 5 for selecting at which setting in Table 2 the anti-theft device 1 should be operated. In this regard, the driver can freely select the operational setting ofBy providing one the anti-theft device of vehicle 1 with free setting selection ability, it is possible to have easily setting of selection suitable for according to the preference of the driver, the destination of the vehicle, type of vehicle, and/or the cost of the vehicle. Further, such a

setting capability may also and thus possible to reduce the manufacturing cost of the device 1 thereof.

[0052] ~~In addition, a~~According to ~~the arrangement described above~~an implementation of the device 1, the driver can also easily know whether the device 1 is set to the anti-theft caution condition. For example, as mentioned above, ~~since the setting confirmation sound can be generated when it the device 1 has been set to the anti-theft caution condition, it is possible to easily know whether the device 1 has been set to the anti-theft caution condition.~~ Furthermore, it is possible to signal to the driver that the device 1 is not set, for example, by providing the device 1 with the hazard warning lamp flashing switch that can, it is possible to commence the flashing of the hazard warning lamps if the device 1 is not set. ~~under a condition in which the alarm means is not set. Also it is possible to easily add the hazard warning lamp flashing function.~~ Such a feature can be easily added to a vehicle having been that does not provided with have the hazard warning lamp flashing function by providing the anti-theft device 1 with such a function.

Third embodiment

[0053] ~~Fig.FIG. 5 is a flow chart showing the operation of the third another~~ embodiment of the anti-theft device ~~of vehicle of the present invention~~1.

[0054] Similarly to the ~~anti-theft device of vehicle 1~~ shown in ~~Fig.FIGS. 1 and Fig. 2~~, the anti-theft device 1 of vehicle of the third embodiment represented in FIG. 4 can comprises the anti-theft control circuit 5 and relays 6, 7, and 8. ~~Connected to the anti-theft device of vehicle 1 are an~~ Additionally, the ignition switch 10, a the dimmer switch 15, a the headlight 16, a the sensor 17, an the ECU 11, a the turn signal lamp (L) 25, a the turn signal lamp (R) 26, an the alarm means 20, and an the indicator 21 can be connected to the device 1. Since each of these structural elements is can be the same as that of the first embodiments described above, a detailed description of them these elements will be omitted not be repeated. As mentioned above, although the arrangement embodiment shown in Figs.FIGS.

1 and 2 can includes two immobilizer means for inputting the ignition switch 10 to relay 6, it is sufficient for the anti-theft device 1 to include at least one immobilizer means. In addition although the arrangement ~~is~~ can be structured so that respective ~~conditions~~ states of the dimmer switch 15 and the headlight 16 can be inputted, input of at least one of these states ~~it is~~ can be sufficient ~~for the anti-theft device 1 to have at least one of them~~. Furthermore, the ~~function of lighting~~ of the turn signal lamps (L, R) 25 and 26 is not necessarily required.

[0055] ~~Then the Exemplary operations of the anti-theft device of vehicle 1 of the embodiment represented in FIG. 5 will now be hereinafter described.~~ Reference numerals enclosed in brackets in the following description correspond to those shown in a flow chart of ~~Fig.~~ FIG. 5.

[0056] ~~In the description below~~ accordance with another implementation of the present invention, circumstances in which the anti-theft device 1 is set when can be configured with respective states of the dimmer switch 15 and the headlight 16 determining whether the device 1 is set to the anti-theft caution condition. The operation of an embodiment of the device 1, wherein the dimmer switch 15 is in the low beam position and the headlight 16 is in the lighting ~~lighting condition~~ state will now be described (such an embodiment is included in Table 3 as No. 1). Table 3 shows several combinations of settings obtained from respective states of the dimmer switch 15 and the headlight 16. Other such details of Table 3 are described further below.

[0057] [Table 3]

	Dimmer switch	Headlight	Alarm	Immobilizer
No. 1	Low beam position	Lighting	Set	Set
No. 2		Lighting-off	Set	—
No. 3	High beam position	Lighting	—	Set
No. 4		Lighting-off	—	—

[0058] ~~First of all,~~ Referring now to the flowchart illustrated in FIG. 5, the “ON” or “OFF” state ~~condition~~ of the ignition switch 10 is initially observed (S301) ~~and concrete control is carried out when the ignition switch 10 is turned “OFF” (S301-OFF).~~ When the ignition switch 10 is turned “OFF”, confirmation of the position of the dimmer switch 15 is carried out (S302). ~~When~~ Thus, in accordance with an embodiment, with the ignition switch 10 turned “OFF”, and the dimmer switch 15 is in the high beam position, confirmation of the condition-state of the headlight 16 is carried out (S310). When the headlight 16 is in the ~~lighting-off condition~~ lighting-off state (No. 4 in Table 3), it the device 1 is not shifted-set to the anti-theft caution condition. ~~and thus, turning the operation of the ignition switch 10 “OFF” would only causes only the stop of engine to stop (S310-Lighting-off), and would not set the device 1 to the anti-theft caution condition (S303).~~

[0059] ~~When~~ However, when the dimmer switch 15 is in the low beam position (S302-Low), the device 1 can be set to the anti-theft caution condition is set (S303). ~~One concrete content of the setting of~~ When the device 1 is set to the anti-theft is caution condition; ~~first of all, to generate a setting confirmation sound can be generated that for indicating indicates that the device 1 has been set setting of to the anti-theft caution condition.~~ The setting confirmation sound ~~is~~ can be generated by using the alarm means 20. In addition, according to one implementation, when the headlight 16 is in the lightinglighting conditionstate, the relay 6 is turned “OFF” and to operate the immobilizer means prevents start of the so as not to start an engine. ~~When~~ According to another implementation, when the headlight 16 is in the lighting-off conditionstate, only the alarm means is set. In an additional implementation, when the dimmer switch 15 is in the high beam position and the headlight 16 is in the lightinglighting condition-state (S310-lightinglighting), only the immobilizer means is set. Furthermore, Then it is indicated by flashing in another implementation, the indicator 21 can flash to indicate that the situation-device 1 is now in the anti-theft caution condition (S304). Thus the driver can leave his (or her) vehicle.

[0060] ~~When~~ Referring still to FIG. 5, if the key is inserted to the ignition switch 10 and turned “ON” during while the device 1 is in the anti-theft caution condition (S305-

ON), the anti-theft caution condition is-can be released (S308). ~~One concrete content of the releasing~~ The release of the anti-theft caution condition is-to light-off-can include turning off the indicator 21 and to-stop-deactivating the immobilizer means by turning the relay 6 "ON" (however, the immobilizer function-is-unconcerned-in-cases-means can be unnecessary in the embodiments represented in of-Nos. -2 and 4 in Table 3).

[0061] ~~Under~~ While the device 1 is set to the anti-theft caution condition, operation of the sensor 17 ~~is-can be~~ observed by the anti-theft control circuit 5 (S306). If the sensor 17 detects unintentional vibration or movement of vehicle under the anti-theft caution condition (S306-Yes), if the alarm means is set, the alarm is-can be generated-triggered (S307). ~~One concrete content~~ Triggering of the alarm is-to generate-can include generation of an alarm sound by the alarm means 20. Additionally, the triggering of the alarm can also cause other manifestations, including ~~It is additionally possible to~~ flashing of the turn signal lamps (L, R) 25 and 26.

[0062] As described above, ~~since it is shifted~~ the device 1 can be set to the anti-theft caution condition when the ignition switch 10 of vehicle is turned "OFF", ~~under the selection of conditions of the dimmer switch 15 is in the low or high position, and the headlight 16 is in the lighting state. Thus, whether or not the device 1 is set to the,~~ it can be easily determined whether or not it should be set in the anti-theft caution condition is determined by only-by-selecting a combination of the position (high beam position or low beam position) of the dimmer switch 15 and the condition-state (lightinglighting or lighting-off conditionlighting-off state) of the headlight 16. The easiness-facility of selection makes the selecting method unforgettable and thus makes it possible to prevent generation of ~~ends to ensure that the driver will not trigger an unintentional alarm sound and disability-disable of start of the engine. That is, when a-the driver does not want to set the anti-theft device 1 (such as, for example, when a-the driver leaves a-the vehicle unattended within a short range the eye can reach e.g. such as a case of fuel charge at a gas station), it-the device can be easily operated, the anti-theft caution condition can be easily controlled, provide easy selection and prevent-unintentional generation of alarm sound and disability of start of the~~

engine can be prevented, only by selecting the combination of the position (high beam position or low beam position) of the dimmer switch 15 and the condition-state (lighting or ~~lighting-off condition~~lighting-off state) of the headlight 16.

[0063] ~~Although it has~~As described above,~~that~~ the alarm means and the immobilizer means ~~are~~can be set in accordance with the combination of the ~~conditions~~states shown in Table 3. However, according to another embodiment of the device 1, it is also possible to set the alarm means and the immobilizer means can be set in accordance with other combinations of the positions of the dimmer switch 15 and the states of the headlight 16. It is further possibleIn accordance with yet other embodiments of the device 1, not limited to the combinations in Table 3, it is possible to make the device 1 anti-theft caution condition so that at least one of the alarm means and the immobilizer means iscan be set to the anti-theft caution condition when the ignition switch 10 is turned "OFF" and in condition of the headlight 16 by selecting the other combinations of the position (high beam position or low beam position) of the dimmer switch 15 and the condition-state (lighting or lighting-off conditionlighting-off state) of the headlight 16 are selected. In any case, implementations of the device 1 can allow it is possible to easily determine easy and ready determination as to whether it the device 1 should be set to the anti-theft caution condition or not. In addition, easinessIt is contemplated that such facility of selection makes it possible can tend to prevent unintentional generation of the alarm sound and disabilitydisabling of the start of the engine.

[0064] In any of the arrangement-embodiments described above, the driver can selection at which a given setting (such as those illustrated Nos. 1-4 in Table 3) at which the anti-theft device 1 will be operated. The device can be configured such that the selection of the setting is done in should be operated can be determined in a secured manner, such as by the anti-theft control circuit 5 or in a selectable manner by providing a switch in the anti-theft control circuit 5 for selecting at which setting the anti-theft device 1 should be operated. By providing oneIn this regard, the driver can freely select the operational setting of the anti-theft device of vehicle 1 with free setting-selection ability, it is possible to have easily setting of selection suitable for according to the preference of the driver, the destination of the vehicle,

the type of vehicle, and/or the cost of the vehicle. Further, such a setting capability may also and thus possible to reduce the manufacturing cost thereof of the device 1.

[0065] ~~In addition,~~ According to the arrangement described above ~~an~~ implementation of the device 1, the driver can also easily know whether the device 1 is set to the anti-theft caution condition. For example, as mentioned above, since the setting confirmation sound can be generated when it the device 1 has been set to the anti-theft caution condition, it is possible to easily know whether the device 1 has been set to the anti-theft caution condition. Furthermore, it is possible to signal to the driver that the device 1 is not set, for example, by providing the device 1 with the hazard warning lamp flashing switch that can, it is possible to commence the flashing of the hazard warning lamps if the device 1 is not set. under a condition in which the alarm means is not set. Also it is possible to easily add the hazard warning lamp flashing function. Such a feature can be easily added to a vehicle having been that does not provided with have the hazard warning lamp flashing function by providing the anti-theft device 1 with such a function.

Fourth embodiment

[0066] ~~Fig. FIG. 6 is a flow chart showing the operation of the fourth another~~ embodiment of the anti-theft device of vehicle of the present invention 1.

[0067] ~~Similarly to the anti-theft device of vehicle 1 shown in Fig. FIGS. 1 and Fig. 2, the anti-theft device 1 of vehicle of the fourth embodiment represented in FIG. 6 can comprises the anti-theft control circuit 5 and relays 6, 7, and 8. Connected to the anti-theft device of vehicle 1 are an~~ Additionally, the ignition switch 10, a the dimmer switch 15, a the headlight 16, a the sensor 17, an the ECU 11, a the turn signal lamp (L) 25, a the turn signal lamp (R) 26, an the alarm means 20, and an the indicator 21 can be connected to the device 1. Since each of these structural elements is can be the same as that of the first embodiments described above, a detailed description of them these elements will not be repeated will be omitted. As mentioned above, although the arrangement embodiment shown in Figs. FIGS. -1

~~and-2 can~~ includes two immobilizer means for inputting the ignition switch 10 to relay 6, it is sufficient for the anti-theft device 1 to include at least one immobilizer means. In addition although the arrangement ~~is-can be~~ structured so that respective ~~conditions-states~~ of the dimmer switch 15 and the headlight 16 can be inputted, input of at least one of these states can be it is sufficient for the anti-theft device 1 to have at least one of them. Furthermore, the ~~function-of-lighting of~~ the turn signal lamps (L, R) 25 and 26 is not necessarily required.

[0068] ~~Then the Exemplary operations of the anti-theft device of vehicle-1 of the embodiment represented in FIG. 6 will now be hereinafter-described.~~ Reference numerals enclosed in brackets in the following description correspond to those shown in a flow chart of ~~Fig.FIG. 6.~~

[0069] ~~First of all, Referring now to the flowchart illustrated in FIG. 5, the “ON” or “OFF” condition-state of the ignition switch 10 is initially observed (S401) and concrete control is carried out when the ignition switch 10 is turned “OFF” (S401-OFF).~~ When the ignition switch 10 is turned “OFF”, confirmation of the position of the dimmer switch 15 is carried out (S402). Thus, in accordance with an embodiment, with the ignition switch 10 turned “OFF”, and When the dimmer switch 15 is in the high beam position, it-the device 1 is not shifted-set to the anti-theft caution condition. Thus, and thus the operation of the ignition switch 10 causes-would only cause the engine to stop of engine-(S402-Hi), and would not set the device 1 to the anti-theft condition (S403).

[0070] ~~When-However, when~~ the dimmer switch 15 is in the low beam position (S402-Low), the device 1 can be set to the anti-theft caution condition-is set (S403). ~~One concrete content of the setting-When the device 1 is set to the of anti-theft iscaution condition, first of all, to generate, a setting confirmation sound for indicating-can be generated that indicates that the device 1 has been set to the setting-of anti-theft caution condition.~~ The setting confirmation sound is-can be generated by using the alarm means 20. ~~Then-Furthermore, it is indicated by flashing-in another implementation, the indicator 21 can~~

flash to indicate that the situation-device 1 is now in the anti-theft caution condition (S404).
Thus the driver can leave his (or her) vehicle.

[0071] ~~When Referring~~ still to FIG. 6, in accordance with another embodiment, if the key is inserted to the ignition switch 10 and turned "ON" ~~during while the device is in the~~ anti-theft caution condition (S405-ON), the relay 6 ~~is-can be~~ turned "OFF" to actuate the immobilizer means so as not to enable start of an engine (S410). Then, when the dimmer switch 15 is turned from its low beam position to its high beam position (S411-Hi), the relay 6 ~~is-can be~~ turned "ON" to release the immobilizer means so as to enable start of an engine (S412) and to release the anti-theft caution condition (S408).

[0072] ~~Under While the device 1 is set to the~~ anti-theft caution condition, operation of the sensor 17 ~~is-can be~~ observed by the anti-theft control circuit 5 (S406). If the sensor 17 detects unintentional vibration or movement of vehicle under the anti-theft caution condition (S406-Yes), the alarm is-can be generated-triggered (S407). ~~One concrete content~~ Triggering of the alarm is-to generate-can include generation of an alarm sound by the alarm means 20. Additionally, the triggering of the alarm can also cause other manifestations, including It is-additionally possible to flashing of the turn signal lamps (L, R) 25 and 26.

[0073] As described above, when releasing the anti-theft caution condition, it is also possible to observe the change of the eondition-state of the dimmer switch 15 and the headlight 16. By enabling the anti-theft caution condition to be released only when the several conditions are satisfied, it is possible to firmly achieve the anti-theft of vehicle.

[0074] Finally, ~~a concrete form-an exemplary embodiment~~ of the alarm means 20, ~~which which is a commonly used in~~ can be utilized in combination with the embodiments 1- ~~4described above, is now provided.~~ Fig-FIG. 7 shows ~~the detail-a schematic view of the-an~~ embodiment of the alarm means 20. The alarm means can comprises the anti-theft control circuit 5, a piezoelectric buzzer 20a ~~forming the alarm means 20,~~ and a piezoelectric buzzer driving circuit 9 for driving the piezoelectric buzzer 20a. As previously described, the ~~anti-~~

~~theft-control circuit 5 is~~ can a controlling section for wholly control the anti-theft device of ~~vehiele-1~~. The ~~anti-theft-control circuit 5~~ can includes an oscillating means for generating oscillating signals controlled by hardware or software. According to one example of the oscillating means controlled by software, "ON" and "OFF" of I/O port of CPU ~~are~~ can be repeated by software and the oscillating signals ~~are~~ can be generated by its repeating cycle. The piezoelectric buzzer driving circuit 9 can generate oscillating signals having sufficient electric power to drive the piezoelectric buzzer by superposing electric current on the oscillating signals from the ~~anti-theft-control circuit 5~~. The ~~anti-theft-control circuit 5~~, the piezoelectric buzzer driving circuit 9, and the piezoelectric buzzer 20a ~~are~~ can be formed on the same circuit board.

[0075] In ~~the~~ anti-theft devices of ~~vehiele~~ of the prior art, the oscillating circuit for generating the oscillating signals, the piezoelectric buzzer driving circuit, and the piezoelectric buzzer ~~are~~ were integrally formed, and these structural elements ~~are~~ were formed separately from the ~~anti-theft-control circuit~~. ~~In addition~~ The ~~anti-theft-prior art~~ control circuit would only controls the "ON" and "OFF" of the piezoelectric buzzer. Accordingly, it ~~is~~ was impossible to change the receiving frequency of the piezoelectric buzzer and sound pressure level from the anti-theft control circuit.

[0076] However, according to embodiments of the ~~anti-theft-device 1~~ of ~~vehiele~~ of the present invention, ~~since~~ because the ~~anti-theft-control circuit 5~~, the piezoelectric buzzer driving circuit 9, and the piezoelectric buzzer 20a ~~are~~ can be integrally formed and the ~~anti-theft-control circuit 5~~ ~~has~~ can have the oscillating means, it is possible to change the oscillating frequency from the ~~anti-theft-control circuit 5~~ and thus, it is possible to appropriately change sound tone of the piezoelectric buzzer. In addition, it is possible to adjust the sound pressure level of the piezoelectric buzzer 20a by using the frequency characteristics between the frequency and the sound pressure of the piezoelectric buzzer 20a. Furthermore, as shown in ~~Fig.~~ FIG. 7, when the piezoelectric buzzer 20a is used with its two inputs being inputted by oscillating signals having respectively opposite phases, it is possible

to adjust the sound pressure by not inputting any oscillating signal to one input or by inputting oscillating signal of any phase difference not opposite signal.

~~Applicability to industries~~

[0077] The ~~anti-theft device 1 of vehicle~~ of the present invention can be applied to various kinds of vehicles having a dimmer switch and a headlight, such as a 4four-wheeled vehicle, a motorcycle, a buggy, a snowmobile, a ~~and~~ snow vehicle, etc.

[0078] The present invention has been described with reference to the preferred embodiment. Obviously, modifications and alternations ~~will~~ can occur to those of ordinary skill in the art upon reading and understanding the preceding detailed description. It is intended that the present invention be construed as including all such alternations and modifications insofar as they come within the scope of the appended claims or the equivalents thereof.

WHAT IS CLAIMED IS:

~~_____ 1. An anti theft device of vehicle comprising at least one of an alarm means for generating alarm on detection of theft and an immobilizer means for preventing the start of an engine on detection of theft, characterized in that at least one of the alarm means and the immobilizer means being can be set to an anti theft caution condition when an ignition switch of a vehicle is turned off and under a condition in which when a dimmer switch is either in a high beam or a low beam position.~~

~~_____ 2. An anti theft The device of vehicle of Claim 11 wherein a user can freely select at his will the setting of at least one of or unsetting of the alarm means and the immobilizer is determined by in which the position of the dimmer switch is selected.~~

~~_____ 3. An anti theft device of vehicle comprising at least one of an alarm means for generating alarm on detection of theft and an immobilizer means for preventing the start of engine, on detection of theft characterized in that at least one of the alarm means and the immobilizer means can being be set to a caution condition when an ignition switch of vehicle is turned off and when under a condition in which a headlight is either in a lighting or lighting off state.~~

~~_____ 4. An anti theft The device of vehicle of Claim 33 wherein a user can freely select at his will the setting or unsetting of at least one of the alarm means and the immobilizer is determined by the state in which condition the of the headlight is there.~~

~~_____ 1. 5. An anti theft device of vehicle comprising at least one of an alarm means for generating alarm on detection of theft and an immobilizer means for preventing the start~~

of engine, on detection of theft characterized in that ~~at least one of the alarm means and the immobilizer means can be being set to a caution condition in accordance with a combination of a high beam or a low beam position of a dimmer switch and a lighting or lighting off condition~~lighting off state of a headlight.

2. ~~6. An anti-theft~~ The device of vehicle of Claim 55 wherein a user can freely select at his will the setting or unsetting at least one of the alarm means and the immobilizer is determined by the in which combination of the position of the dimmer switch position and the state of the headlight condition is there.

3. ~~7. An anti-theft~~ The device of vehicle of any one of Claims 1-6-5 wherein a setting confirmation sound is generated when at least one of the alarm means or and the immobilizer means is set.

4. ~~8. An anti-theft~~ The device of vehicle of any one of Claims 1-75 wherein the alarm means comprises a hazard warning lamp flashing means for flashing hazard warning lamps during operation of the alarm means and a hazard warning lamp flashing switch, the flashing means being operative to flash the hazard warning lamps during operation of the alarm means and to and can start the flashing of the hazard warning lamps by the hazard warning lamp flashing switch under a condition in which the caution meansdevice is not set to the anti-theft caution condition.

22. ~~9. An anti-theft~~ The device of vehicle of any one of Claims 1-8-5 wherein the alarm means is comprises a piezoelectric buzzer, a control section, and a piezoelectric driving section, the; wherein further comprising a control section having a oscillating means for controlling the anti-theft device of vehicle and for generating a signal for the piezoelectric buzzer, and at the piezoelectric driving section for driving the piezoelectric buzzer,; and wherein the control section, the piezoelectric buzzer driving section and the piezoelectric buzzer are formed as a unit.

10. An anti-theft device comprising at least one of an alarm means for generating alarm and an immobilizer means for preventing the start of an engine, at least one of the alarm means and the immobilizer means being set to an anti-theft caution condition when an ignition switch of a vehicle is turned off and when a dimmer switch is either in a high-beam or a low-beam position.

11. The device of Claim 10 wherein the setting of at least one of the alarm means and the immobilizer is determined by the position of the dimmer switch.

12. The device of Claim 10 wherein the alarm means comprises a hazard warning lamp flashing means and a hazard warning lamp flashing switch, the flashing means being operative to flash the hazard warning lamps during operation of the alarm means and to flash the hazard warning lamps by the hazard warning lamp flashing switch under a condition in which the device is not set to the anti-theft caution condition.

13. The device of Claim 10 wherein the alarm means comprises a piezoelectric buzzer, a control section, and a piezoelectric driving section, the control section having a oscillating means for controlling the device and for generating a signal for the piezoelectric buzzer, the piezoelectric driving section for driving the piezoelectric buzzer, wherein the control section, the piezoelectric buzzer driving section and the piezoelectric buzzer are formed as a unit.

14. An anti-theft device of vehicle comprising at least one of an alarm means for generating alarm and an immobilizer means for preventing the start of engine, at least one of the alarm means and the immobilizer means being set to a caution condition when an ignition switch of vehicle is turned off and when a headlight is either in a lighting or lighting-off state.

15. The device of Claim 14 wherein the setting of at least one of the alarm means and the immobilizer is determined by the state of the headlight.

16. The device of Claim 14 wherein the alarm means comprises a hazard warning lamp flashing means and a hazard warning lamp flashing switch, the flashing means being operative to flash the hazard warning lamps during operation of the alarm means and to flash the hazard warning lamps by the hazard warning lamp flashing switch under a condition in which the device is not set to the anti-theft caution condition.

17. The device of Claim 14 wherein the alarm means comprises a piezoelectric buzzer, a control section, and a piezoelectric driving section, the control section having a oscillating means for controlling the device and for generating a signal for the piezoelectric buzzer, the piezoelectric driving section for driving the piezoelectric buzzer, wherein the control section, the piezoelectric buzzer driving section and the piezoelectric buzzer are formed as a unit.

18. An anti-theft device of vehicle comprising at least one of an alarm means for generating alarm and an immobilizer means for preventing the start of engine, at least one of the alarm means and the immobilizer means being set to a caution condition in accordance with a combination of a high-beam or a low-beam position of a dimmer switch and a lighting or lighting-off state of a headlight.

19. The device of Claim 18 wherein the setting at least one of the alarm means and the immobilizer is determined by the combination of the position of the dimmer switch and the state of the headlight.

20. The device of Claim 18 wherein a setting confirmation sound is generated when at least one of the alarm means and the immobilizer means is set.

21. The device of Claim 20 wherein a setting confirmation sound is generated when at least one of the alarm means and the immobilizer means is set.

22. The device of Claim 18 wherein the alarm means comprises a hazard warning lamp flashing means and a hazard warning lamp flashing switch, the flashing means being operative to flash the hazard warning lamps during operation of the alarm means and to flash the hazard warning lamps by the hazard warning lamp flashing switch under a condition in which the device is not set to the anti-theft caution condition.

23. The device of Claim 18 wherein the alarm means comprises a piezoelectric buzzer, a control section, and a piezoelectric driving section, the control section having a oscillating means for controlling the device and for generating a signal for the piezoelectric buzzer, the piezoelectric driving section for driving the piezoelectric buzzer, wherein the control section, the piezoelectric buzzer driving section and the piezoelectric buzzer are formed as a unit.

ANTI-THEFT DEVICE OF VEHICLE

ABSTRACT OF THE DISCLOSURE

~~An object of the present invention is to provide an anti-theft device of vehicle is~~
~~provided~~ which can easily determine whether or not the ~~anti-theft device~~ should be set ~~on in~~
~~its an anti-theft~~ caution condition; ~~in order to~~ prevent generation of ~~an~~ unintentional alarm
sound ~~and as well as~~ disability of ~~start of engine start~~, and also easily select setting or not of
~~caution condition~~ in accordance with ~~a user's preference~~ selected setting. ~~According to the~~
~~present invention there is provided an~~ The anti-theft device of vehicle can comprising at
least one of an alarm means for generating alarm on detection of theft and an immobilizer
means for preventing the start of engine on detection of theft. ~~characterized in that a~~ At least
one of the alarm means and the immobilizer means can be set to a caution condition when an
ignition switch of vehicle is turned off and when ~~under a condition in which a~~ dimmer
switch is either in a high-beam or a low-beam position and a headlight is in a lighting or
lighting off state.

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